1 Accelerator Parameters

There are currently 3 e^+e^- linear collider design efforts underway, differing most significantly in the particular choice of RF acceleration. The TESLA collaboration, centered at DESY, makes use of superconducting RF cavities with resonant frequency of 1.3 GHz. The NLC collaboraton, centered at SLAC, makes use of regular conducting X band cavities with resonant frequency of 11 GHz. The CLIC collaboration, centered at CERN, makes use of drive beam linac with 30 GHz normal conducting coupled cavites. The choice of the RF acceleration method causes differences in the bunch structure parameters of the various designs. We will not go into detail on the designs here but just touch briefly on the time structure, energy, and luminosity. Table 1 summarizes these parameters. A more detailed description can be found in reference [1].

1.1 TESLA

The TESLA design uses superconducting cavities, operated at 2 K, with resonant frequency of 1.3 GHz. The baseline design calls for $\sqrt{s} = 500$ GeV, with an upgrade path to 800 GeV. For the baseline design, the beam structure will be long bunch trains of 2820 bunches separated by 337 nsec, for a total bunch train length of 950 μsec (285 km) and a 5 Hz repetition rate. The nominal luminosity is 3.4×10^{34} cm^{-2} sec^{-1}. The The upgrade to higher energy requires better performance from the superconducting cavities.

1.2 NLC

The NLC design uses normal conducting cavities with resonant frequency of 11 GHz. The baseline design calls for $\sqrt{s} = 500$ GeV, with an upgrade path to 1 TeV. For the baseline design, the beam structure will be bunch trains of 95 bunches separated by 2.8 nsec, for a total bunch train length of 0.27 μsec (81 m) and a repetition rate of 120 Hz. The nominal luminosity is 5.4×10^{33} cm^{-2} sec^{-1}. The baseline option only fills half the linac tunnel with RF cavities, enabling a straightforward upgrade to 1 TeV.

	TESLA	NLC	CLIC
RF Cavities	Superconducting	Normal	Normal
RF Power Source	Klystrons	Klystrons	Drive Beam
Bunches / Train	2820	95	150
Bunch Separation	337 nsec	2.8 nsec	0.7 nsec
Repetition Rate	5 Hz	120 Hz	200 Hz
Center of Mass Energy	500 GeV	500 GeV	1 TeV
Luminosity (10^{33} cm^{-2} sec^{-1})	34	5.4	10

Table 1: Baseline parameters for the 3 linear collider designs.

1.3 CLIC

The CLIC design uses normal conducting cavities with resonant frequency of 30 GHz. The novel approach of this design is that the RF power is delivered to the accelerating cavities by a drive beam with coupled cavities. The baseline design calls for $\sqrt{s} = 1$ TeV, with an upgrade path to 3 TeV. For the baseline design, the beam structure will be bunch trains of 150 bunches separated by 0.7 nsec, for a total bunch train length of 0.1 μsec (30 m) and a repetition rate of 200 Hz. The nominal luminosity is 10^{34} cm^{-2} sec^{-1}.

References

[1] **good reference to competing designs**